

NASA SP-7011 (450)  
October 20, 1997

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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20040713 049

# Report Documentation Page

1. Report No. NASA SP-7011 (450)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 450)		5. Report Date October 20, 1997	
		6. Performing Organization Code	
7. Author(s)		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address NASA Scientific and Technical Information Program Office		11. Contract or Grant No.	
		13. Type of Report and Period Covered Special Publication	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Langley Research Center Hampton, VA 23681		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract This report lists reports, articles and other documents recently announced in the NASA STI Database.			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects		18. Distribution Statement Unclassified – Unlimited Subject Category – 52	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 36	22. Price A03/HC

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# Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

- 1. Document ID Number; Corporate Source
- 2. Title
- 3. Author(s) and Affiliation(s)
- 4. Publication Date
- 5. Contract/Grant Number(s)
- 6. Report Number(s); Availability and Price Codes
- 7. Abstract
- 8. Abstract Author
- 9. Subject Terms

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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 450)*

OCTOBER 20, 1997

## 51 LIFE SCIENCES (GENERAL)

19970027399 State Univ. of New York, Stony Brook, NY USA

Fluid Mechanoreception by Marine Copepods *Final Report, 15 May 1992 - 14 May 1996*

Yen, Jeannette, State Univ. of New York, USA; Okubo, Akira, State Univ. of New York, USA; Jun. 1996; 5p; In English

Contract(s)/Grant(s): N00014-92-J-1690

Report No.(s): AD-A325396; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Copepods are small (1-10 mm) crustaceans that inhabit lakes and oceans. When a copepod moves through water or moves water around itself, it creates a fluid disturbance distinct from the ambient fluid motion. In this study, we seek an understanding of how copepods decipher and recognize fluid signals created and transmitted within a 3-dimensional aquatic environment that is filled with small-scale turbulence.

DTIC

*Marine Environments; Zooplankton; Signal Transmission*

19970027952 NASA Marshall Space Flight Center, Huntsville, AL USA

Gene-Based Detection of Microorganisms in Environmental Samples Using PCR

Glass, John I., Alabama Univ., USA; Lefkowitz, Elliot J., Alabama Univ., USA; Cassell, Gail H., Alabama Univ., USA; Wechsler, Mark, Perkin-Elmer Corp., USA; Taylor, Theresa B., Perkin-Elmer Corp., USA; Albin, Michael, Perkin-Elmer Corp., USA; Paszko-Kolva, Christine, Perkin-Elmer Corp., USA; Roman, Monsi C., NASA Marshall Space Flight Center, USA; 1997; 10p; In English; 27th; International Conference on Environmental Systems (ICES), 14-17 Jul. 1997, Lake Tahoe, NV, USA

Contract(s)/Grant(s): NAGw-5081

Report No.(s): NASA-TM-112923; NAS 1.15:112923; Rept-972424; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Contaminating microorganisms pose a serious potential risk to the crew's well being and water system integrity aboard the International Space Station (ISS). We are developing a gene-based microbial monitor that functions by replicating specific segments of DNA as much as  $10(\text{exp } 12)$  x. Thus a single molecule of DNA can be replicated to detectable levels, and the kinetics of that molecule's accumulation can be used to determine the original concentration of specific microorganisms in a sample. Referred to as the polymerase chain reaction (PCR), this enzymatic amplification of specific segments of the DNA or RNA from contaminating microbes offers the promise of rapid, sensitive, quantitative detection and identification of bacteria, fungi, viruses, and parasites. We envision a small instrument capable of assaying an ISS water sample for 48 different microbes in a 24 hour period. We will report on both the developments in the chemistry necessary for the PCR assays to detect microbial contaminants in ISS water, and on progress towards the miniaturization and automation of the instrumentation.

Author

*Microorganisms; Genes; Deoxyribonucleic Acid; Spacecraft Environments; Environmental Control; Sampling; Detection*



19970027953 University of Central Florida, Dept. of Sociology and Anthropology, Orlando, FL USA

Microgravity and Charge Transfer in the Neuronal Membrane: Implications for Computational Neurobiology

Wallace, Ron, University of Central Florida, USA; 1995; 8p; In English; Life Sciences and Space Medicine, 3-5 Apr. 1995, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAGw-577

Report No.(s): NASA-CR-205364; NAS 1.26:205364; AIAA Paper 95-1053; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Evidence from natural and artificial membranes indicates that the neural membrane is a liquid crystal. A liquid-to-gel phase transition caused by the application of superposed electromagnetic fields to the outer membrane surface releases spin-correlated electron pairs which propagate through a charge transfer complex. The propagation generates Rydberg atoms in the lipid bilayer lattice. In the present model, charge density configurations in promoted orbitals interact as cellular automata and perform computations in Hilbert space. Due to the small binding energies of promoted orbitals, their automata are highly sensitive to microgravitational perturbations. It is proposed that spacetime is classical on the Rydberg scale, but formed of contiguous moving segments, each of which displays topological equivalence. This stochasticity is reflected in randomized Riemannian tensor values. Spacetime segments interact with charge automata as components of a computational process. At the termination of the algorithm, an orbital of high probability density is embedded in a more stabilized microscopic spacetime. This state permits the opening of an ion channel and the conversion of a quantum algorithm into a macroscopic frequency code.

Author

*Microgravity; Charge Transfer; Nervous System; Membranes*

19970027962 NASA Ames Research Center, Moffett Field, CA USA

Intrapericardial Denervation: Responses to Water Immersion in Rhesus Monkeys

McKeever, Kenneth H., NASA Ames Research Center, USA; Keil, Lanny C., Ohio State Univ., USA; Sandler, Harold, Ohio State Univ., USA; American Journal of Physiology: Regulatory Integrative Computational Physiology; 1995; ISSN 0363-6119; Volume 268, No. 37, pp. R1040-R1049; In English

Report No.(s): NASA-TM-113036; NAS 1.15:113036; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

Eleven anesthetized rhesus monkeys were used to study cardiovascular, renal, and endocrine alterations associated with 120 min of head-out water immersion. Five animals underwent complete intrapericardial denervation using the Randall technique, while the remaining six monkeys served as intact controls. Each animal was chronically instrumented with an electromagnetic flow probe on the ascending aorta, a strain gauge pressure transducer implanted in the apex of the left ventricle (LV), and electrocardiogram leads anchored to the chest wall and LV. During immersion, LV end-diastolic pressure, urine flow, glomerular filtration rate, sodium excretion, and circulating atrial natriuretic peptide (ANP) each increased ( $P$  less than 0.05) for intact and denervated monkeys. There were no alterations in free water clearance in either group during immersion, yet fractional excretion of free water increased ( $P$  less than 0.05) in the intact monkeys. Plasma renin activity (PRA) decreased ( $P$  less than 0.05) during immersion in intact monkeys but not the denervated animals. Plasma vasopressin (PVP) concentration decreased ( $P$  less than 0.05) during the first 30 min of immersion in both groups but was not distinguishable from control by 60 min of immersion in denervated monkeys. These data demonstrate that complete cardiac denervation does not block the rise in plasma ANP or prevent the natriuresis associated with head-out water immersion. The suppression of PVP during the first minutes of immersion after complete cardiac denervation suggests that extracardiac sensing mechanisms associated with the induced fluid shifts may be responsible for the findings.

Author

*Water Immersion; Cardiovascular System; Endocrinology; Monkeys; Physiological Responses; Physiological Effects*

19970028122 George Mason Univ., Fairfax, VA USA

Workshop on Viability of Halophilic Bacteria in Salt Deposits *Final Report*

1997; 13p; In English

Contract(s)/Grant(s): NAG2-907

Report No.(s): NASA-CR-205331; NAS 1.26:205331; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The significance of finding viable extreme halophiles in halites associated with Permian-aged sedimentary deposits is considered. Issues related to the microbiology and geochemistry of the halite environment are addressed. Recommendations that related the significance of this phenomenon to NASA's interest in planetary exploration and the early evolution of life are provided.

CASI

*Halites; Geochemistry; Microbiology; Mineral Deposits; Planetary Environments; Halophiles*

19970028203 Texas Univ. Health Science Center, San Antonio, TX USA

Carbonic Anhydrase is Required for Statoconia Homeostasis in Organ Cultures of Statocysts from *Aplysia californica*  
Pedrozo, H. A., Texas Univ. Health Science Center, USA; Schwartz, Z., Texas Univ. Health Science Center, USA; Nakaya, H., Texas Univ. Health Science Center, USA; Harrison, J. L., Veterans Administration Hospital, USA; Dean, D. D., Texas Univ. Health Science Center, USA; Wiederhold, M. L., Texas Univ. Health Science Center, USA; Boyan, B. D., Texas Univ. Health Science Center, USA; Journal of Comparative Physiology A. Sensory, Neural and Behavioral Physiology; 1995, No. 177, pp. 415-425; In English; Original contains color illustrations; Sponsored in part by Veterans Administration Medical Research Funds Contract(s)/Grant(s): NSF EEC-92-09612; NAG2-730; NAG2-442; USPHS- DE05937

Report No.(s): NASA-CR-204876; NAS 1.26:204876; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

A novel organ culture system has been developed to study the regulation of statoconia production in the gravity sensing organ in *Aplysia californica*. Statocysts were cultured in Leibovitz (LI5) medium supplemented with salts and *Aplysia* haemolymph for four days at 17 C. The viability of the system was evaluated by examining four parameters: statocyst morphology, the activity of the mechanosensory cilia in the statocyst, production of new statoconia during culture and change in statoconia volume after culture. There were no morphological differences in statocysts before and after culture when ciliary beating was maintained. There was a 29% increase in the number of statoconia after four days in culture. Mean statocyst, statolith and statoconia volumes were not affected by culture conditions. The presence of carbonic anhydrase in the statocysts was shown using immunohistochemistry. When statocysts were cultured in the presence of  $4.0 \times 10^{-4}$  M acetazolamide to inhibit the enzyme activity, there was a decrease in statoconia production and statoconia volume, indicating a role for this enzyme in statoconia homeostasis, potentially, via pH regulation. These studies are the first to report a novel system for the culture of statocysts and show that carbonic anhydrase is involved in the regulation of statoconia volume and production.

Author

*Carbonic Anhydrase; Homeostasis; Enzyme Activity; Culture Techniques; Gravitation; Organs*

19970028208 Florida State Univ., Dept. of Chemistry, Tallahassee, FL USA

Improved Chromatographic Bioavailability Estimations *Final Report, 1 Sep. 1993 - 31 Aug. 1996*

Dorsey, John G., Florida State Univ., USA; Aug. 1996; 4p; In English

Contract(s)/Grant(s): F49620-93-I-0514; AF Proj. 3484

Report No.(s): AD-A326171; AFOSR-97-0267TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The question of how to assess bioavailability has received much attention. Bioavailability is most often approximated by the distribution of the solute in question between two phases, most often bulk phases, of water and an immiscible organic solvent. Since the inception of reversed phase liquid chromatography there have been many attempts to correlate chromatographic retention with bioavailability and the most often used bulk measure, the octanol-water partition coefficient. An entire field has developed around this research, referred to as Quantitative Structure Activity Relationships (QSAR), or where chromatographic retention is the measured parameter, Quantitative Structure Retention Relationships (QSRR). Yet with present technology, these attempts are inevitably doomed to failure. On the one hand, bulk phases are not appropriate for modeling a partitioning process in an interphase such as biological membranes, and while chromatographic stationary phases can be argued as having similar structure to a membrane because of chain organization, the density of the grafted chains is much too low to provide a suitable model. It is these problems which we have come to understand and propose to address.

DTIC

*Liquid Chromatography; Tissues (Biology); Membranes*

19970028350 National Inst. of Environmental Health Sciences, National Toxicology Program, Research Triangle Park, NC USA  
Reproductive Toxicity of Dibromoacetonitrile (CAS No. 3252-43-5) Administered in Diet to SD Rats *Final Report*

Feb. 12, 1997; 412p; In English

Report No.(s): PB97-143127; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The purpose of this study was to assess the general reproductive and development toxicities of dibromoacetonitrile (DBAN) in rats using the Short Term Reproductive and Developmental Toxicity Screening design. This approach is designed to identify the physiologic processes (development; female reproduction; male reproduction; various somatic organs/processes) that are the most sensitive to DBAN exposure. The data are being generated at the request of the U.S. E.P.A. N.H.E.E.R.L., which will use the data to identify water disinfectant by-products (and related compounds) that require further investigation.

NTIS

*Toxicity; Physiology; Females; Males; Exposure*

19970028541 Science and Technology Corp., Hampton, VA USA

Computational Modeling of the Fluorescence of Bacterial Spores *Final Report, Feb. 1994 - Aug. 1995*

Hameka, Hendrik F., Pennsylvania Univ., USA; Jensen, James O., Edgewood Research Development and Engineering Center, USA; Jensen, Janet L., Edgewood Research Development and Engineering Center, USA; Merrow, Clifton N., Science and Technology Corp., USA; Vlahacos, Constantine P., Science and Technology Corp., USA; Feb. 1997; 25p; In English  
Contract(s)/Grant(s): DAAA15-92-D-0015; DA Proj. 1O1-62622-A-553; DA Proj. 1O1-61102-A-71-A

Report No.(s): AD-A326751; ERDEC-CR-216; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We interpret the fluorescence of bacterial spores by studying the fluorescence of dipicolinic acid (2,6- pyridinedicarboxylic acid) and its ion by performing calculations with the Gaussian 92 Program Package. We derived the optimized geometries, charge densities, energies, and vibrational frequencies for the ground state and first excited singlet state of dipicolinic acid and its ion by performing 6 in 6 complete active state MCSCF computations using a 6-31G basis set.

DTIC

*Ultraviolet Radiation; Fluorescence; Transferred Electron Devices; Bacteria; Microorganisms; Spores*

19970028547 NASA Kennedy Space Center, Cocoa Beach, FL USA

Survival of Potentially Pathogenic Human-Associated Bacteria in the Rhizosphere of Hydroponically Grown Wheat  
Morales, Anabelle, University of South Florida, USA; Garland, Jay L., NASA Kennedy Space Center, USA; Lim, Daniel V., University of South Florida, USA; FEMS Microbiology Ecology; 1996; ISSN 0168-6496; Volume 20, pp. 155-162; In English  
Report No.(s): NASA-TM-112886; NAS 1.15:112886; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Plants may serve as reservoirs for human-associated bacteria (H-AB) in long-term space missions containing bioregenerative life support systems. The current study examined the abilities of five human-associated potential pathogens, *Pseudomonas aeruginosa*, *Pseudomonas cepacia*, *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Escherichia coli*, to colonize and grow in the rhizosphere of hydroponically grown wheat, a candidate crop for life support. All of these bacteria have been recovered from past NASA missions and present potential problems for future missions. The abilities of these organisms to adhere to the roots of axenic five-day-old wheat (*Triticum aestivum* L. cv. Yecora rojo) were evaluated by enumeration of the attached organisms after a one hour incubation of roots in a suspension (approximately  $10(\exp 8 \text{ cu/ml})$ ) of the H-AB. Results showed that a greater percentage of *P. aeruginosa* cells adhered to the wheat roots than the other four H-AB. Similarly incubated seedlings were also grown under attempted axenic conditions for seven days to examine the potential of each organism to proliferate in the rhizosphere (root colonization capacity). *P. cepacia* and *P. aeruginosa* showed considerable growth. *E. coli* and *S. aureus* showed no significant growth, and *S. pyogenes* died off in the wheat rhizosphere. Studies examining the effects of competition on the survival of these microorganisms indicated that *P. aeruginosa* was the only organism that survived in the rhizosphere of hydroponically grown wheat in the presence of different levels of microbial competition.

Author

*Bacteria; Hydroponics; Wheat; Survival; Life Support Systems; Microorganisms; Pseudomonas; Closed Ecological Systems; Escherichia; Staphylococcus*

19970028572 Texas A&M Univ., College Station, TX USA

Structural and Functional Studies of Bioluminescent Proteins *Final Report, 1 Sep. 1993 - 31 Aug. 1996*

Ziegler, Miriam M., Texas A&M Univ., USA; Baldwin, Thomas O., Texas A&M Univ., USA; Jun. 09, 1997; 7p; In English  
Contract(s)/Grant(s): N00014-93-I-1345

Report No.(s): AD-A326480; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This grant provided support between September 1993 and August 1996 for the dissertation research of several predoctoral students. Highlights of their collective accomplishments include: (1) participating in the crystallization and analysis of the high resolution structures of the bacterial luciferase Alpha Beta heterodimer and the Beta2 homodimer, (2) elucidation of a detailed kinetic mechanism for the folding and assembly of the luciferase subunits, (3) use of spectroscopic techniques and mutant enzymes to probe the active site and subunit interface of bacterial luciferase, and (4) characterization by genetic methods of the role of the LuxR transcriptional activator protein in density-dependent control of gene expression.

DTIC

*Bioluminescence; Proteins; Bioinstrumentation; Bacteria*

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AEROSPACE MEDICINE

*Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.*

19970027533 Texas Univ. Health Science Center, School of Public Health, Houston, TX USA

The Role of an Organized Exercise and Diet Program in the Primary Prevention of Ischemic Coronary Artery Disease in the U.S. Air Force Aviators

Lavallee, Philip J., Texas Univ. Health Science Center, USA; May 1997; 44p; In English

Report No.(s): AD-A325581; AFIT-97-042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Community health protection for asymptomatic ischemic coronary artery disease (ICAD) for U.S. Air Force pilots includes a regulation (AFI 48-123), which requires screening of cholesterol levels. If an officer is not qualified on initial exam, he does not begin pilot training. If a qualified pilot develops a disqualifying condition, the test is repeated in about 3-6 months after 'prudent diet' modification. If he confirms disqualifying cholesterol levels, he is then grounded and may have to receive a mega-workup to rule out ICAD, including a coronary artery angiogram evaluation at Brooks AFB, TX. to avoid this mega-workup, many flight surgeons are prescribing medications such as lovastatin to improve cholesterol levels, without giving a diet and exercise program a legitimate trial to work. The Air Force has developed a health promotions program which has been generally underutilized. Current practice is that almost no pilots, identified with medically disqualifying cholesterol levels, are referred to the health promotions program. This practice has been witnessed by the author as a practicing flight surgeon at 3 Air Force Bases, and has been verified by interview with more than 12 flight surgeons at more than 12 different Air Force Bases in the USA and overseas. Since military pilots are trained at U.S. taxpayer expense and the training costs usually exceed \$1 million to be fully combat capable, and since these pilots are responsible for multimillion dollar aircraft, it makes economic sense that these pilots be held to high standards of professional and physical fitness in order to defend our country.

DTIC

*Physical Exercise; Armed Forces (USA); Cholesterol; Coronary Artery Disease; Physical Fitness; Diets; Health*

19970027539 Pacific Environmental Services, Herndon, VA USA

Preventing Work-Related Musculoskeletal Illnesses Through Ergonomics: The Air Force PREMIER Program, Volume 3A. Level 1 Ergonomics Methodology Guide for Administrative Work Areas *Final Report*

Joyce, Marilyn, Little (Arthur D.), Inc., USA; Marcotte, Andrew, Little (Arthur D.), Inc., USA; Calvez, Van, Little (Arthur D.), Inc., USA; Barker, Richard, Little (Arthur D.), Inc., USA; Crawford, Pat, Pacific Environmental Services, USA; Feb. 1997; 517p; In English

Contract(s)/Grant(s): F41624-95-D-9017

Report No.(s): AD-A325659; AL/OE-TR-1996-0158-V3A; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

This report describes a methodology which allow technicians with minimal ergonomics training to identify risk factors, select realistic controls, facilitate modifications, and measure the impact of ergonomic modifications to USA Air Force administrative workplaces.

DTIC

*Musculoskeletal System; Medical Services; Human Factors Engineering; Education*

19970027597 Federation of American Societies for Experimental Biology, Bethesda, MD USA

Retinal Neurobiology and Visual Processing *Final Report, 1 May 1996 - 30 Apr. 1997*

Copenhagen, David, Federation of American Societies for Experimental Biology, USA; Oct. 03, 1996; 27p; In English, 13-18 Jul. 1996, Saxtons River, USA

Contract(s)/Grant(s): F49620-96-I-0128; AF Proj. 2313

Report No.(s): AD-A325859; AFOSR-TR-97-0185; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The sessions were organized as follows: (1) Visual Performance, (2) Signal Transduction and Modulation in ON Bipolar cells, (3) Mechanisms and Functions of Gap Junction Coupling, (4) Ionic Channels to Machines, (5) Synaptic Mechanisms in the Outer Plexiform Layer, (6) 'Potpourri' (Speakers selected from those who submitted poster abstracts), (7) GABAC Receptors, (8) Synaptic Processes in the Inner Plexiform Layer and (9) Ecology of Vision. The response to this conference was very enthusiastic. Thirteen of 59 participants who completed evaluation forms ranked the meetings the best conference they had attended. 41 of 59 ranked it as being in the top 10%. The attendance has grown steadily since the first conference on retina was held in 1992.

DTIC

*Visual Signals; Visual Perception; Image Processing; Conferences; Bifurcation (Biology); Neurology*

19970027683 Pacific Environmental Services, Inc., Herndon, VA USA

Preventing Work-Related Musculoskeletal Illnesses Through Ergonomics: The Air Force PREMIER Program, Volume 4A, Level I Ergonomics Methodology Guide for Maintenance/Inspection Work Areas *Final Report*

Marcotte, Andrew, Little (Arthur D.), Inc., USA; Calvez, Van, Little (Arthur D.), Inc., USA; Joyce, Marilyn, Little (Arthur D.), Inc., USA; Barker, Richard, Little (Arthur D.), Inc., USA; Klinenberg, Edward J., Armstrong Lab., USA; Cogburn, Cynthia D., Armstrong Lab., USA; Goddard, Don E., Armstrong Lab., USA; May 1997; 968p; In English

Report No(s): AD-A325660; AL/OE-TR-1996-0158-VOL-4A; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

This report describes a methodology which allow technicians with minimal ergonomics training to identify risk factors, select realistic controls, facilitate modifications, and measure the impact of ergonomic modifications to USA Air Force 1 maintenance/inspections workplaces.

DTIC

*Human Factors Engineering; Musculoskeletal System; Occupational Diseases*

19970027887 Naval Health Research Center, San Diego, CA USA

Effects of Training at Altitude on Anaerobic Distance and Critical Velocity

Hodgdon, J. A., Naval Health Research Center, USA; Vickers, R. R., Jr., Naval Health Research Center, USA; Sucec, A. A., San Diego State Univ., USA; Apr. 1997; 10p; In English

Report No(s): AD-A326086; NHRC-96-23; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A work capacity model has been proposed as a means of estimating both aerobic and anaerobic capacities from a series of performance measures. The relationship between power and time is modeled as a rectangular hyperbola offset by an amount reflecting a power output which theoretically can be maintained indefinitely ( $P_{crit}$ ). Additionally, the amount of work that can be performed at levels above  $P_{crit}$  is fixed and referred to as the anaerobic work capacity ( $W_{an}$ ). Run times for distances of 1609, 3218, and 4828 m were recorded at sea level (140 m) 5 days prior to (PRE) travel to 2440 m altitude, within 5 days of arrival at 2440 m (ALT), and within 5 days of return to sea level (RTN) for 19 college track athletes. Values for critical velocity ( $V_{crit}$ ) and anaerobic distance ( $D_{an}$ ) were determined for each individual at each session (PRE, ALT, and RTN) as the intercept and slope, respectively of the linear least squares regression of running velocity on the inverse of run time for the three performance runs.  $V_{crit}$  was used as an estimate of  $P_{crit}$  in the model and  $D_{an}$  as an estimate of  $W_{an}$ . There was a variation in  $V_{crit}$  with session.  $V_{crit}$  was smaller at altitude than at sea level. There was also a small but significant increase in  $V_{crit}$  at RTN compared to PRE.  $V_{crit}$  differed between genders, but there was no gender by session interaction.  $D_{an}$  also varied with session having decreased values at altitude relative to sea level. There were no differences in PRE and RTN values for  $D_{an}$  no gender differences, and no gender by session.

DTIC

*Aerobes; Anaerobes; Human Performance; Work Capacity; Altitude Acclimatization; Exercise Physiology; Physiological Responses*

19970027932 Columbia Univ., Dept. Biological Sciences, Franklin Square, NY USA

Electrical and Chemical Modulation of Synaptic Efficacy *Final Report, 1 Jul. 1993 - 30 Jun. 1996*

Poo, Mu-ming, Columbia Univ., USA; May 13, 1997; 5p; In English

Contract(s)/Grant(s): N00014-90-J-1865

Report No(s): AD-A326974; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To investigate how electric currents associated with Synaptic activity and chemical factors released by the pre- and postsynaptic cells affect the efficacy of synaptic transmission, in order to understand the plasticity of synaptic functions at single neuron level. Monolayer cultures of dissociated neurons from rat hippocampi or of neurons and myocytes from *Xenopus* embryos are prepared, the synaptic functions are assayed by patch-clamp whole-cell recording and fluorescence imaging of intracellular calcium. Electrical activity is induced in the neuronal network by extracellular or intracellular stimuli and chemical factors are bath- or focally-applied to the synapses.

DTIC

*Synapses; Chemical Properties; Electrical Properties; Electric Current*

19970028009 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA

Forum on the Health of Women in the Military *Final Report, 22 Dec. 1995 - 31 Dec. 1996*

Poth, Merrily, Uniformed Services Univ. of the Health Sciences, USA; Dec. 1996; 374p; In English

Contract(s)/Grant(s): MIPR-96MM6648

Report No.(s): AD-A326071; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

A meeting, the 'Forum on the Health of Women in the Military' was held 17-19 June 1996 at The Uniformed Services University of the Health Sciences. Prior to the meeting we commissioned papers to review selected topics to be addressed at the meeting. These reviews were distributed to the participants of the conference before the meeting and served as background materials for discussions at the meeting itself. The purpose of this process was to allow a wider distribution of the available information to those caring for the health of women in the military and to those making policy affecting these women. The proceedings of the meeting, including the commissioned papers and edited transcripts of all the talks, are submitted in this report.

DTIC

*Physical Fitness; Public Health; Conferences; Females; Armed Forces (USA)*

19970028060 Georgetown Univ., Medical Center, Washington, DC USA

Project DEPRAD (Deployable Radiology and Tel eradiology System) in Bosnia/Hungary *Final Report, 26 Feb. 1996 - 25 Mar. 1997*

Mun, Seong K., Georgetown Univ., USA; Mar. 1997; 150p; In English

Contract(s)/Grant(s): DAMD17-96-2-6004

Report No.(s): AD-A327615; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

As part of the NATO implementation forces, peace keeping mission, 20,000 U.S. troops were deployed to Bosnia-Herzegovina. The U.S. Army chose to deploy telemedicine and teleradiology in support of the deployed personnel. This provided state-of-the-art diagnostic services to the troops, along with real-time immediate diagnosis of the radiological images by a remote Radiologist. The Deployable Radiology(DEPRAD)network was designed by personnel at the Imaging Science and Information Systems(ISIS)Center at Georgetown University Medical center to provide rapid access to radiological images acquired in Bosnia. In less than 8 weeks, a complete system was designed, developed and deployed utilizing 11 vendors equipment and their standard off the shelf components. Wide area communications were designed and coordinated by the U.S. Army Medical Research and Materiel Command. The Defense Information Systems Agency (DISA) and Department of Defense, Health Affairs, contracted commercial satellite support and terrestrial communication lines to support the project in Bosnia and Hungary. The success of the telemedicine network prompted the U.S. Army to consider and arrange for deployment of similar technologies in other parts of the world where troops are deployed.

DTIC

*Real Time Operation; Medical Science; ISIS Satellites; Imaging Techniques; Information Systems; Defense Program; Communication Cables*

19970028157 Connecticut Univ., Health Center, Farmington, CT USA

Heat Shock Protein-Peptide Complexes as Anti-Viral Agents

May 09, 1997; 12p; In English

Contract(s)/Grant(s): ARPA Order F152

Report No.(s): AD-A325919; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this Grant is for the University of Connecticut Health Center (UC) to test the efficacy of vaccination with heat shock protein (HSP)-peptide complexes in eliciting protection in an influenza virus model. This effort shall be carried out generally as set forth in the Grantee's proposal entitled 'Heat Shock Protein-Peptide Complexes as Anti-Viral Agents' submitted in 1996, a copy of which is in the possession of both parties.

DTIC

*Antiinfectives and Antibacterials; Health; Peptides; Thermal Shock; Vaccines; Viruses*

19970028343 Manchester Univ., Inst. of Science and Technology, UK

The Effects of Accommodation, Vergence and Pupil Size on Size Estimation *Final Report*

Charman, W. N., Manchester Univ., UK; Koh, L.-H., Manchester Univ., UK; Mar. 15, 1997; 203p; In English

Contract(s)/Grant(s): F61708-95-W-0292

Report No.(s): AD-A326590; SPC-95-4035; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report results from a contract tasking UMIST Ventures Office as follows: The contractor will determine the validity of various theoretical optical models in predicting changes in retinal image size and carry out a pilot study which monocular and binocular estimates of apparent size are made as a function of distance and other parameters.

DTIC

*Validity; Pupil Size; Optical Equipment; Eye Movements*

19970028444 Istituto Superiore di Sanita, Rome, Italy

Proximity systems: Analysis of health risks *Turchi magneticianalysis of health risks*

Barbaro, V., Istituto Superiore di Sanita, Italy; Bartolini, P., Istituto Superiore di Sanita, Italy; Donato, A., Istituto Superiore di Sanita, Italy; Militello, C., Istituto Superiore di Sanita, Italy; Polichetti, A., Istituto Superiore di Sanita, Italy; Vecchia, P., Istituto Superiore di Sanita, Italy; Mar. 1996; ISSN 1123-3117; 56p; In Italian

Report No.(s): ISTISAN-96-02; DE97-716360; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

The results of a study on the magnetic fields generated by proximity systems for the controlled access of personnel are reported. Besides data from experimental measurements, the results are presented of theoretical calculations of induced currents inside the body. Health risks are also evaluated based on a comparison with the most advanced international standards. Finally, possible effects of interference with implanted pacemakers are analyzed in detail.

DOE

*Health; Risk*

19970028455 North Dakota Univ., Grand Forks, ND USA

Effect of Altitude on Short Term Memory

Bartholomew, Cathy J., North Dakota Univ., USA; Jun. 18, 1997; 66p; In English

Report No.(s): AD-A326603; AFIT-97-063; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Hypoxia also known as altitude sickness, is a deficiency of oxygen in the blood. Although there are a variety of situations which can lead to hypoxia it is most often associated with high altitudes and thus is of special concern to the field of aviation. If nothing is done to increase the oxygen level in the blood, death is possible. The two main focuses of this study are at what altitude do these performance decrements occur and what exactly are the cognitive processes affected.

DTIC

*Memory; Hypoxia; Altitude Sickness*

19970028542 Massachusetts Univ. Medical Center, Worcester, MA USA

Human Immune Responses to Experimental Vaccinia Vaccines *Final Report, 1 Jun. 1994 - 30 Nov. 1996*

Ennis, Francis A., Massachusetts Univ. Medical Center, USA; Dec. 1996; 74p; In English

Contract(s)/Grant(s): DAMD17-94-C-4063

Report No.(s): AD-A326470; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Members of the U.S. Armed Forces receive immunization with vaccinia virus vaccine. Efforts to develop a safe and effective tissue culture-derived vaccinia vaccine to replace the standard vaccine produced by scarification on cows' skin have advanced early clinical studies. It is generally accepted that protection induced by the conventional vaccinia vaccine correlated with cellular immune responses to live experimental and standard vaccinia vaccines. During the two years of this contract we have: (1) obtained, separated and cryopreserved peripheral blood mononuclear cells from 92 vaccines in a clinical study to compare the standard and an experimental small pox vaccine, (2) prepared live and killed vaccinia virus antigens, (3) performed lymphocyte proliferation and cytotoxic T cell assays and (4) performed immunoblot assays on vaccine donor samples. Both vaccines stimulated vaccinia virus-specific humoral and cellular immune responses in the vaccines, however, the standard smallpox vaccine stimulated significantly stronger immune responses through the traditional cutaneous route of inoculation.

DTIC

*Viruses; Vaccines; Immunology; Physiological Responses*



## BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

19970027356 Army Research Lab., Aberdeen Proving Ground, MD USA

*The Effects of Divided Attention on Peripheral Target Localization Final Report*

Rohaly, Ann Marie, Army Research Lab., USA; Karsh, Robert, Army Research Lab., USA; Apr. 1997; 32p; In English

Contract(s)/Grant(s): DA Proj. IL1-61102-B7-4A

Report No.(s): AD-A325895; ARL-TR-1334; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Designers and users of helmet mounted displays often assume that single eye devices reduce operator workload relative to dual eye devices by allowing two tasks to be performed simultaneously, one by each eye. In other words, the two eyes are assumed to constitute separate attentional channels. To test this assumption, we implemented a modified version of the useful field of view (UFOV) paradigm to measure the effects of dichoptically divided attention on dual task performance. Subjects localized a peripheral target within a semicircular region of 30 radius while simultaneously performing a foveal task. The degree of difficulty of the experiment was manipulated by varying the foveal task workload and the number of clutter (distractor) items in the periphery. The foveal and peripheral tasks were either presented to the same eye (monocular viewing) or different eyes (dichoptic viewing). Peripheral target localization performance was essentially perfect at all eccentricities for all the non clutter conditions: monocular and dichoptic viewing, low and high foveal task workload. Introduction of peripheral clutter caused a significant deficit in localization performance that increased with increasing target eccentricity. Similar to the non clutter conditions, there was no difference in performance between monocular and dichoptic viewing. Thus, we find no evidence to support the assumption that dividing attention between two eyes allows dual tasks to be performed more efficiently than when attention is divided within the same eye, implying that the two eyes do not constitute separate attentional channels.

DTIC

*Visual Perception; Helmet Mounted Displays; Human Factors Engineering; Human Performance*

19970027535 Texas Univ., Dept. of Neurobiology and Anatomy, Houston, TX USA

*Analysis and Synthesis of Adaptive Neural Elements and Assemblies Final Report, 30 Sep. 1993 - 29 Sep. 1996*

Byrne, John H., Texas Univ., USA; Sep. 30, 1996; 13p; In English

Contract(s)/Grant(s): F49620-93-I-0272; AF Proj. 2312

Report No.(s): AD-A325538; AFOSR-97-0144TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several general principles are emerging from these studies. First, the functional organization of neural circuits is dynamic, and a single circuit, such as a CPG, can produce several distinct outputs, which in turn, can mediate different behaviors. Second, modulatory transmitters can regulate the functional organization of circuits as well as their responsiveness to inputs. Third, motivational systems can influence behaviors, in part, by acting on motor systems, such as CPGs. Fourth, motor systems possess cellular mechanisms capable of supporting complex forms of neuronal plasticity, which in turn, may contribute to learning and memory. These general principles illustrate that motor behaviors are governed by highly adaptive neural networks and help to explain how systems of nerve cells function to produce and modulate behavior.

DTIC

*Neural Nets; Biosynthesis; Nervous System; Behavior; Learning; Memory; Cytology*

19970027589 Northeastern Univ., Dept. of Psychology, Boston, MA USA

*Spatial Frameworks for Perceived Environments Final Report, 1 May 1994 - 28 Feb. 1997*

Bryant, David J., Northeastern Univ., USA; Feb. 17, 1997; 46p; In English

Contract(s)/Grant(s): F49620-95-I-0404; AF Proj. 3484

Report No.(s): AD-A326241; AFOSR-97-0285TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Research examined mental representation of spatial information. Spatial frameworks are based on an egocentric reference frame, and intrinsic computation on an object centered frame. Research documented the use of spatial frameworks in memory for observed and modeled scenes, but intrinsic computation for memory of diagrams. Intrinsic computation was also used in perception of models and diagrams. Reference frame is under strategic control; instructions to use one or the other guides the representation of diagrams and models. Spontaneous use of spatial frameworks is determined by the directness with which information about all three spatial dimensions are conveyed. Related experiments revealed that differences in accessibility result from the relative salience of body axes. Laterality and handedness do not affect the accessibility of spatial locations. Additional research documented the use of a Euclidean metric for representing haptically explored space and the effortful rather than automatic rehearsal



of visual spatial location. The rehearsal process depends critically on eye movements between locations. New projects have begun to explore pattern perception and the metric structure underlying spatial concepts.

DTIC

*Pattern Recognition; Lateral Stability; Eye Movements; Coordinates*

19970027734 New Energy and Industrial Technology Development Organization, Tokyo, Japan

Leading research on brainware *Nokino joho shori no sendo kenkyu*

Mar. 1996; 255p; In Japanese

Report No.(s): NEDO-PR-95009; DE97-717511; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Leading research on brainware is conducted to realize the engineering information processing based on the learning, memorization, association, intuition, value judgment, and motivation which are activities of human brains. For the highly integrated information society at the 21st century, it will be essential to establish human-like information processing technology which is considered to be difficult with the conventional computers. The R and D theme for this technology will focus on the development of novel devices and systems by eliciting the principles and key roles of information processing functions of the brain and in living organisms from both viewpoints of the science and engineering and the brain information science. It is considered that important research targets are in elucidating brain functions and the modeling and developing novel devices and systems, such as brain information architecture, neural devices, neural networks, and man-machine interface. Technical trend surveys in the USA, the UK, and Germany were also conducted.

DOE

*Human Performance; Learning; Memory; Brain; Behavior; Central Nervous System; Data Processing*

19970027740 California Univ., Sponsored Projects Office, Berkeley, CA USA

Learning Controllers for Complex Behavioral Systems

Crawford, Lara S., California Univ., USA; Sastry, S. Shankar, California Univ., USA; Dec. 03, 1996; 18p; In English

Contract(s)/Grant(s): DAAH04-96-I-0341; DAAH04-94-G-0211; DAAH04-95-05888; DAAH03-91-G-0171

Report No.(s): AD-A325516; ARO-35873.4-MA-MUR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Biological control systems routinely guide complex dynamical systems through complicated tasks such as running or diving. Conventional control techniques, however, stumble with these problems, which have complex dynamics, many degrees of freedom, and a task which is often only partially specified. To address problems like these, we are using a biologically inspired, hierarchical control structure, in which controllers composed of radial basis function networks learn the controls required at each level of the hierarchy. Through learning and proper encoding of behaviors and controls, some of these difficulties in controlling complex systems can be overcome.

DTIC

*Artificial Intelligence; Computerized Simulation; Neural Nets; Dynamic Programming; Complex Systems; Control Systems Design; Controllers; Running; Diving (Underwater)*

19970027872 Oregon Univ., Dept. of Psychology, Portland, OR USA

Upward Influence Strategies: The Effect of Consistency and Reciprocity Approaches on Supervisory Compliance and Performance Evaluations

Meisenhelder, Helen M., Oregon Univ., USA; Jun. 30, 1997; 82p; In English

Report No.(s): AD-A327022; AFIT-97-077; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Subordinates frequently employ specific tactics (upward influence strategies) in their attempts to obtain rewards or compliance from supervisors. In this research project, the effects on supervisory compliance and subordinates' performance evaluations of strategies based on consistency and reciprocity were examined. ROTC cadets, acting as supervisors, were exposed to written scenarios in which key subordinates solicited their compliance. After exposure to these influence attempts, participants evaluated the subordinates. Compliance was measured by supervisory agreement with the subordinate's recommendation. Results indicate that the use of consistency or reciprocity strategies, either in combination or alone, is significantly more effective in producing supervisory compliance than control conditions. No differences were found between the use of a combination of consistency and reciprocity and the consistency approach used alone. However, the combination of consistency and reciprocity was more effective in facilitating supervisory compliance than reciprocity used alone. Use of these tactics did not effect performance ratings.

DTIC

*Human Performance; Human Relations; Ratings; Human Behavior*

19970027886 Colorado State Univ., Fort Collins, CO USA

[Trainee Motivation]

Osten, Kevin D., Colorado State Univ., USA; Jun. 1997; 45p; In English

Report No.(s): AD-A326060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The general purpose of this research proposal was to gain a more thorough understanding of trainee motivation. To accomplish this, trainee motivation was examined, with a specific emphasis on motivation to learn, and the antecedents of motivation to learn. The Theory of Planned Behavior was introduced as a mechanism for outlining and understanding how the antecedents of motivation result in motivation levels. The Theory of Planned Behavior stresses that behavioral intentions capture the motivational factors that influence behavior. Although not identical by definition, behavioral intentions and motivation represent very similar constructs in this paper.

DTIC

*Human Performance; Motivation; Psychology; Human Behavior; Conditioning (Learning)*

19970027929 Air Force Inst. of Tech., Graduate School of Engineering, Wright-Patterson AFB, OH USA

Physiologically-Based Vision Modeling Applications and Gradient Descent-Based Parameter Adaptation of Pulse Coupled Neural Networks

Broussard, Randy P., Air Force Inst. of Tech., USA; Jun. 1997; 116p; In English

Report No.(s): AD-A327028; AFIT/DS/ENG/97-02; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In this research, pulse coupled neural networks (PCNNs) are analyzed and evaluated for use in primate vision modeling. An adaptive PCNN is developed that automatically sets near-optimal parameter values to achieve a desired output. For vision modeling, a physiologically motivated vision model is developed from current theoretical and experimental biological data. The biological vision processing principles used in this model, such as spatial frequency filtering, competitive feature selection, multiple processing paths, and state dependent modulation are analyzed and implemented to create a PCNN based feature extraction network. This network extracts luminance, orientation, pitch, wavelength, and motion, and can be cascaded to extract texture, acceleration and other higher order visual features. Theorized and experimentally confirmed cortical information linking schemes, such as state dependent modulation and temporal synchronization are used to develop a PCNN-based visual information fusion network. The network is used to fuse the results of several object detection systems for the purpose of enhanced object detection accuracy. On actual mammograms and FLIR images, the network achieves an accuracy superior to any of the individual object detection systems it fused. Last, this research develops the first fully adaptive PCNN. Given only an input and a desired output, the adaptive PCNN will find all parameter values necessary to approximate that desired output.

DTIC

*Neural Nets; Visual Perception; Vision; Physiological Effects; Models; Information Processing (Biology)*

19970028119 Wisconsin Univ., Madison, WI USA

Primary and Secondary Ties as They Relate to Formal Support Need and Utilization

Rearden, Katherine P., Wisconsin Univ., USA; Jun. 18, 1997; 196p; In English

Report No.(s): AD-A326963; AFIT-97-016D; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This study seeks to advance insight into the mechanics of the social support process by examining the relationships between informal support and community ties and one's need for and use of formal social support services. This secondary hierarchical regression data analysis employs cross sectional data that were gathered by the USA Air Force as a stratified, random probability sample of 100,000 active duty military members of which roughly 51% responded to an anonymous mail survey. This study examines the relationship between informal and formal social support in order to develop explanatory models generating causal hypotheses for future investigation. A major gap in the area of informal and formal social support is addressed in that this population is healthy compared to the elderly, physically and mentally ill populations typically examined in the study of informal and formal social support linkages. Regardless of the degree of informal tie, primary (marital) or secondary (community volunteerism) informal support was positively related to both the need for, and the use of, formal support services consistent with complementary theory. Findings suggest that marital status and community volunteerism may not function as sources of informal support in the military population. Rather, marital status and community volunteerism may actually function as sources of formal support in the military culture representing a marked departure from current conceptualizations in social support linkage research. Also positively related to the need for formal support was the number of hours one volunteered in one's community. Conversely, satisfaction with either marital or community informal support predicted less need for formal support. The physical availability of one's marital partner was not related to the need for, nor the use of formal support in an overseas subsample.

DTIC

*Public Relations; Armed Forces (USA); Regression Analysis; Social Factors*

19970028209 Minnesota Univ., Dept. of Psychology, Minneapolis, MN USA

Cognitive/Self-Regulatory Aptitudes and Instructional Methods for Complex Skill Learning *Final Report, 1 Mar. 1993 - 31 Aug. 1996*

Ackerman, Phillip L., Minnesota Univ., USA; Kanfer, Ruth, Minnesota Univ., USA; Oct. 25, 1996; 45p; In English

Contract(s)/Grant(s): F49620-93-I-0206; AF Proj. 2313

Report No.(s): AD-A326169; RR-96-01; AFOSR-97-0266TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Research conducted in this project covered four related topics. (1) A theoretical and empirical examination of the taxonomic structure of perceptual speed abilities, both in general, and in the context of predictive validity for task performance. (2) Extension of previous work by Ackerman and Kanfer on the determinants of individual differences in skill acquisition by examining performance after extended practice, and by examining performance after a non-practice retention period. (3) Integration of ability and non-ability predictors of individual differences in skill acquisition. (4) Using theory and empirical data obtained in previous Air Force sponsored research and the current program, interactions between aptitudes and instructional treatments were examined. DTIC

*Human Performance; Tasks; Predictions*

19970028346 Institute for Human Factors TNO, Soesterberg, Netherlands

Image Fusion and Spatial Localisation *Beeldfusie en Spatiele Localisatie*

Toet, A., Institute for Human Factors TNO, Netherlands; Ijspeert, J. K., Institute for Human Factors TNO, Netherlands; VanDorrestelijn, M. J., Institute for Human Factors TNO, Netherlands; Apr. 16, 1997; 24p; In English; Original contains color illustrations

Contract(s)/Grant(s): A90/KLu/319

Report No.(s): TNO-Rept-TM-97-A031; TD-97-0194; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., P.O. Box 23, 3769 ZG Soesterberg, Netherlands), Hardcopy, Microfiche

The results of this experiment show that given time, test subjects could determine the relative location of a target in a static battlefield scene with an accuracy which is independent of the actual image modality used.

Derived from text

*Target Acquisition; Target Recognition; Visual Acuity; Visual Perception; Visual Signals*

19970028358 Civil Aeromedical Inst., Oklahoma City, OK USA

Use of Object-Oriented Programming to Simulate Human Behavior in Emergency Evacuation of an Aircraft's Passenger Cabin *Final Report*

Court, M. C., Oklahoma Univ., USA; Marcus, J. H., Civil Aeromedical Inst., USA; Aug. 1997; 14p; In English

Report No.(s): DOT/FAA/AM-97/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progress in the development of a computerized aircraft cabin evacuation model is described. The model has a two-fold purpose (1) to supplement current certification tests that use human subjects, and (2) to serve in the investigation of aircraft accidents as a reconstruction tool and identify factors influencing survival of passengers. For the model to be a valid predictive tool when simulating aircraft accidents, the toxic and debilitating effects on passenger behavior of fire and smoke must be modeled. Other aircraft cabin evacuation models use an expert system/rule-based approach to simulate these effects. The work described here presents an object-oriented approach to modeling human behavior in aircraft cabin evacuations. Object-oriented programming (OOP) lends itself to the modeling of complex systems. OOP's foundation is modularity. OOP allows a one-to-one correspondence with the physical world, and thus, eases the burden of model validation. Validation is critical to the successful use of a model as a predictive tool and involves testing to ensure that the model accurately reflects the behavior of a real system. Easing model validation is of particular importance since the real system's environment is hazardous, and performing any tests on the real system is either impossible or not repeatable. The result of this work will help to expand the simulation's capabilities in improved passenger queuing analysis by allowing the incorporation of human behavior into class objects.

Author

*Object-Oriented Programming; Human Behavior; Passengers; Aircraft Accidents; Computerized Simulation; Emergencies; Predictions*

19970028456 Hughes Training, Inc. Mesa, AZ USA

An Eye Tracking System for Analysis of Pilots' Scan Paths *Final Report, Jun. 1995 - Nov. 1996*

Wetzel, Paul A., Hughes Training, USA; Krueger-Anderson, Gretchen, Hughes Training, USA; Poprik, Christine, Air Force Systems Command, USA; Bascom, Peter, El-Mar, Inc., Canada; Apr. 1997; 13p; In English; 18th; Industry Training Systems and Education, 2-4 Dec. 1996, Orlando, FL, USA

Contract(s)/Grant(s): F41624-95-C-5011; AF Proj. 1123

Report No.(s): AD-A326750; AL/HR-TR-1996-0145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Portable eye movement and automated analysis systems have been developed for use in pilot training and other applications where it is necessary to monitor and analyze changes in an observer's point of regard. The eye movement system hardware consists of a lightweight, head-mounted, two-dimensional eye tracker and miniature scene camera, an electronic control and processing unit, and a video recorder and monitor. This system, manufactured by El Mar, Inc., is easily transportable and weighs less than 10 Kg. During training, a small crosshair indicating the point of regard is electronically combined with video from the scene camera and both are recorded on video tape for later analysis by an integrated image processing system. The automated analysis system determines which objects were viewed, how long each was viewed, and the order in which they were viewed. The present systems were used to measure and analyze the visual scan paths of pilots in three aircraft simulators. This was done to determine whether data of this kind can be used to increase training effectiveness by identifying efficient scanning strategies and by quantifying differences in the behavior of expert and novice pilots. Scan paths were evaluated for: (1) T-37 instructor pilots (IPs) and T-37 student IPs (rated pilots training to be IPs) while they performed precision instrument approaches in a motion base simulator, (2) F-16 IPs while performing air-to-air scenarios in the Air Combat Engagement Simulator (ACES) and (3) F-16 LANTIRN IPs while performing low-level scenarios in the LANTIRN simulator. The results of these evaluations are described.

DTIC

*Eye Movements; Image Processing; Helmet Mounted Displays; Video Data*

19970028598 Defence Science and Technology Organisation, Air Operations Div., Canberra, Australia

Simulating Human Characteristics for Operational Studies *Topical Report*

Lloyd, Ian V., Defence Science and Technology Organisation, Australia; Apr. 1997; 42p; In English

Report No.(s): AD-A326755; DSTO-RR-0098; DODA-AR-010-179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of errors in models of human response on the outcome of a simulated sequence of events can be significantly large compared to the precision with which physical events are typically modelled. The effects of such errors can accumulate when events are propagated up and down a command and control chain. For a simulation of a system to be realistic, the products of simulated human decisions should be available in accordance with human cognitive limitations and at human rates of response. An approach to structuring simulations of human tactical response is proposed. This approach requires pre-processing of the simulation procedures to establish their cognitive resource loading for different levels of simulated expertise. Run-time processes are also required to regulate access of behaviour algorithms to simulated cognitive resources, and to dynamically adjust those resources as a function of stress.

DTIC

*Decision Making; Man Machine Systems; Command and Control; Human Reactions; Algorithms*

## 54

### MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

*Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.*

19970027275 NASA Johnson Space Center, Houston, TX USA

The Effects of Liquid Cooling Garments on Post-Space Flight Orthostatic Intolerance

Billica, Roger, NASA Johnson Space Center, USA; Kraft, Daniel, Harvard Medical School, USA; The Sixth Alumni Conference of the International Space University; Jul. 1997, pp. 125; In English; Also announced as 19970027257; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche; Abstract Only; Abstract Only

Post space flight orthostatic intolerance among Space Shuttle crew members following exposure to extended periods of microgravity has been of significant concern to the safety of the shuttle program. Following the Challenger accident, flight crews were required to wear launch and entry suits (LES). It was noted that overall, there appeared to be a higher degree of orthostatic intolerance among the post-Challenger crews (approaching 30%). It was hypothesized that the increased heat load incurred when

wearing the LES, contributed to an increased degree of orthostatic intolerance, possibly mediated through increased peripheral vasodilatation triggered by the heat load. The use of liquid cooling garments (LCG) beneath the launch and entry suits was gradually implemented among flight crews in an attempt to decrease heat load, increase crew comfort, and hopefully improve orthostatic tolerance during reentry and landing. The hypothesis that the use of the LCG during reentry and landing would decrease the degree of orthostasis has not been previously tested. Operational stand-tests were performed pre and post flight to assess crewmember's cardiovascular system's ability to respond to gravitational stress. Stand test and debrief information were collected and databased for 27 space shuttle missions. 63 crewpersons wearing the LCG, and 70 crewpersons not wearing the LCG were entered into the database for analysis. Of 17 crewmembers who exhibited pre-syncope symptoms at the R+O analysis, 15 were not wearing the LCG. This corresponds to a 21% rate of postflight orthostatic intolerance among those without the LCG, and a 3% rate for those wearing LCG. There were differences in these individuals' average post-flight maximal systolic blood pressure, and lower minimal Systolic Blood pressures in those without LCG. Though other factors, such as type of fluid loading, and exercise have improved concurrently with LCG introduction, from this data analysis, it appears that LCG USAge provided a significant degree of protection from post-flight orthostatic intolerance.

Author

*Orthostatic Tolerance; Flight Clothing; Space Suits; Launching; Space Shuttle Orbiters; Spacecrews; Tolerances (Physiology); Human Factors Engineering*

19970027379 NASA Johnson Space Center, Houston, TX USA

Understanding Skill in EVA Mass Handling, Volume 2, Empirical Investigation

Riccio, Gary, Nascent Technologies, USA; McDonald, Vernon, Nascent Technologies, USA; Peters, Brian, Krug International, USA; Layne, Charles, Krug International, USA; Bloomberg, Jacob, NASA Johnson Space Center, USA; Jul. 1997; 40p; In English

Contract(s)/Grant(s): RTOP 199-16-11-48

Report No.(s): NASA-TP-3684; S-827; NAS 1.60:3684; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report we describe the details of our empirical protocol effort investigating skill in extravehicular mass handling using NASA's principal mass handling simulator, the precision air bearing floor. Contents of this report include a description of the necessary modifications to the mass handling simulator; choice of task, and the description of an operationally relevant protocol. Our independent variables are presented in the context of the specific operational issues they were designed to simulate. The explanation of our dependent variables focuses on the specific data processing procedures used to transform data from common laboratory instruments into measures that are relevant to a special class of nested control systems (discussed in Volume 1): manual interactions between an individual and the substantial environment. The data reduction is explained in the context of the theoretical foundation described in Volume 1. Finally as a preface to the presentation of the empirical data in Volume 3 of this report series, a set of detailed hypotheses is presented.

Author

*Extravehicular Activity; Protocol (Computers); Dependent Variables; Simulators; Astronaut Performance*

19970027508 National Defence Research Establishment, Div. of Command and Control Technology, Linköping, Sweden

Decision-Making Using Temporal Reasoning and Situation Adapted Sensor Control *Topical Report Beslutsfattande med Användning av Temporal Omvärldsuppfattning och Situationsanpassad Sensorstyning*

Stroemberg, Dan, National Defence Research Establishment, Sweden; Sep. 1996; ISSN 1104-9154; 33p; In English

Report No.(s): PB97-144547; FOA-R-96-00302-3.4-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report consists of three parts: state of the art of Pilot's Associate; the temporal decision support paradigm in avionics, and sensor management to relieve pilot's work load. The purpose of the American Pilot's Associate research program was to apply artificial intelligence to aid aircraft pilots, creating intelligent assistance. The second part of the report covers important background to the temporal decision support paradigm that is currently under development. The third part deals with the problem of managing all sensor systems.

NTIS

*Aircraft Pilots; Decision Making; Automatic Control; Measuring Instruments; Pilot Performance; Artificial Intelligence*

19970027727 New Energy and Industrial Technology Development Organization, Tokyo, Japan  
Research on the proficient machine system. Theoretical part *Jukutatsu machine system no chosa kenkyu. Rironhen*  
Mar. 1996; 244p; In Japanese  
Report No.(s): NEDO-PR-950004; DE97-717505; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The basic theory of the proficient machine system to be developed was studied. Important proficient techniques in manufacturing industries are becoming extinct because of insufficient succession to next generation. The proficient machine system was proposed to cope with such situation. This machine system includes the mechanism for progress and evolution of techniques and sensibilities to be adaptable to environmental changes by learning and recognizing various motions such as work and process. Consequently, the basic research fields are composed of thought, learning, perception and action. This machine requires not only designed fixed functions but also introduction of the same proficient concept as human being to be adaptable to changes in situation, purpose, time and machine's complexity. This report explains in detail the basic concept, system principle, approaching procedure and practical elemental technologies of the proficient machine system, and also describes the future prospect.

DOE

*Artificial Intelligence; Biometrics; Human Factors Engineering; Investigation; Knowledge Based Systems*

19970027834 Geltech, Inc., Alachua, FL USA  
Optical Limiting Windows for Eye and Sensor Protection from Laser Radiation *Final Report, 1 Sep. 1996 - 31 May 1997*  
Moreshead, William, Geltech, Inc., USA; Nogues, Jean-Luc, Geltech, Inc., USA; McBranch, Duncan, Los Alamos National Lab., USA; Jun. 24, 1997; 23p; In English  
Contract(s)/Grant(s): DAAH04-96-C-0077  
Report No.(s): AD-A326991; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The vulnerability of human eyes and sensing devices to high power laser radiation presents a critical need in both the military and private sectors for protection devices. These devices must permit normal eye and sensor functions while blocking all damaging wavelengths when subjected to high power radiation. Optical power limiting provides just such a mechanism for this type of passive protection. Optical limiting has been investigated in a number of materials with distinct nonlinear mechanisms. Of these materials, the most widely investigated are: (1) Organic and organometallic molecules which rely on reverse saturable absorption (RSA). The more promising RSA materials include heavy-atom-substituted phthalocyanines 2,3, porphyrins 4, and fullerenes 5. The phthalocyanines have demonstrated superiority at the most commonly investigated wavelength of 532 nm, and show optical power limiting for a range of wavelengths in the visible spectral region. Very recent studies have shown enhanced properties of fullerenes in the red and near-IR 6, 7, 8, 9. (2) Colloidal carbon suspensions, which rely on nonlinear scattering. While they yield broadband limiting in the near-IR, carbon suspension materials are widely regarded as unsatisfactory, especially in view of the requirement that they be used in a liquid state.

DTIC

*Laser Beams; Radiation Hazards; Optical Properties; High Power Lasers; Eye Protection; Phthalocyanin; Fullerenes*

19970027854 Allied-Signal Aerospace Co., Aerospace Equipment Systems, Torrance, CA USA  
Enhanced Molecular Sieve CO<sub>2</sub> Removal Evaluation *Final Report*  
Rose, SUSAn, Allied-Signal Aerospace Co., USA; ElSherif, Dina, Allied-Signal Aerospace Co., USA; MacKnight, Allen, Allied-Signal Aerospace Co., USA; Sep. 05, 1996; 67p; In English  
Contract(s)/Grant(s): NASw-5033  
Report No.(s): NASA-CR-205324; Rept-97-69288; NAS 1.26:205324; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of this research is to quantitatively characterize the performance of two major types of molecular sieves for two-bed regenerative carbon dioxide removal at the conditions compatible with both a spacesuit and station application. One sorbent is a zeolite-based molecular sieve that has been substantially improved over the materials used in Skylab. The second sorbent is a recently developed carbon-based molecular sieve. Both molecular sieves offer the potential of high payoff for future manned missions by reducing system complexity, weight (including consumables), and power consumption in comparison with competing concepts. The research reported here provides the technical data required to improve CO<sub>2</sub> removal systems for regenerative life support systems for future IVA and EVA missions.

Author

*Carbon Dioxide Removal; Life Support Systems; Absorbents; Spacecraft Environments; Air Purification*

19970028048 DCS Corp., Alexandria, VA USA

**Modeling the Interface Between a Respirator and the Human Face *Final Report***

Piccione, Dino, DCS Corp., USA; Moyer, E. T., Jr., DCS Corp., USA; Mar. 1997; 52p; In English

Contract(s)/Grant(s): DAAL01-96-C-0077

Report No.(s): AD-A325547; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents a multi-disciplined approach to the issue of modeling the interface between the respirator (protective mask) and human face. The modeling efforts encompass discomfort, digital modeling of mask surfaces, digital modeling of the human face, and finite element analysis. The FEA process was used to register the digital model of the mask seal onto the digital model of a face. The finite element modeling evaluated the boundary conditions to predict fit and discomfort.

DTIC

*Mathematical Models; Masks; Comfort; Finite Element Method; Computer Aided Design; Respirators; Protective Clothing; Face (Anatomy)*

19970028131 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**Situational Awareness Guidelines**

Garner, K. T., Naval Air Warfare Center, USA; Assenmacher, T. J., Naval Air Warfare Center, USA; Jan. 08, 1997; 133p; In English

Report No.(s): PB97-150114; NAWCADPAX-96-268-TM; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The primary purpose of the Situational Awareness Guidelines is to provide structure for acquisition and program managers, as well as system developers, to apply during the development cycle that will result in more efficient and effective information presentation for the operator. The guidelines are organized into seven functional areas: 1.0 System Features, 2.0 Display Formatting, 3.0 Information Coding, 4.0 Enhancement Coding, 5.0 Auditory Coding, 6.0 Environmental Stressors, and 7.0 Advanced Technology. Each functional area is further broken into categories. A Rationale, explaining why the items are important to situational awareness, introduces each category. The specific guidelines follow the rationale.

NTIS

*Flight Crews; Human Performance; Human Factors Engineering; Tactics; Data Systems*

19970028222 NASA Marshall Space Flight Center, Huntsville, AL USA

**Performance Testing of a Russian Mir Space Station Trace Contaminant Control Assembly**

Curtis, R. E., Boeing Defense and Space Group, USA; Perry, J. L., NASA Marshall Space Flight Center, USA; Abramov, L. H., Nauchno-Proizvodstvennoe Obedinenie Niichimmash, USSR; 1997; 14p; In English; 27th; Environmental Systems, 14-17 Jul. 1997, Lake Tahoe, NV, USA

Report No.(s): NASA-TM-112626; NAS 1.15:112626; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A filter assembly which is incorporated into the Russian Trace Contaminant Control Assembly was tested for removal of airborne trace chemical contaminants in a closed loop 9 m(exp 3) system. Given contaminant loading rates and maximum allowable atmospheric concentrations, the Russian system was able to maintain system air concentrations below maximum allowable limits. This was achieved for both a new filter system and for a system where a part of it was pre-loaded to emulate 3 years of system age.

Author

*Trace Contaminants; Performance Tests*

19970028366 Natick Research, Development and Engineering Center, Natick, MA USA

**A Supplement to the 1995 Matched Anthropometric Database of US Marine Corps Personnel: Summary Statistics *Final Report, Oct. - Dec. 1995***

Paquette, Steven P., Natick Research, Development and Engineering Center, USA; Gordon, Claire C., Natick Research, Development and Engineering Center, USA; Brantley, J. D., Natick Research, Development and Engineering Center, USA; Case, Henry W., Geo-Centers, Inc., USA; Gaeta, Donna J., Geo-Centers, Inc., USA; Jun. 1997; 89p; In English

Contract(s)/Grant(s): DAAK60-90-D-0002

Report No.(s): AD-A327698; NATICK-TR-97/015; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Anthropometric databases that are representative of the user population are necessary for the design and sizing of clothing, equipment and workspaces. In 1996, a U.S. Marine Corps (USMC) anthropometric database of 76 dimensions for males and females was derived from the large 1988 U.S. Army Anthropometric Survey (ANSUR) database using a statistical matching procedure. The need to include USMC body size information in the Jack human figure model provided the impetus to derive additional



anthropometric variables. Summary statistics and the measurement descriptions for the 36 dimensions contained herein are provided as a supplement to the initial USMC matching report.

DTIC

*Anthropometry; Data Bases*

19970028377 Naval Postgraduate School, Monterey, CA USA

Aircrew Centered System Design Analysis Considerations for The MH-53E Helicopter

Gibson, Gregory J., Naval Postgraduate School, USA; Dec. 1996; 140p; In English

Report No.(s): AD-A326856; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

An analysis was made of the aircrew centered system design aspects for the MH-53E helicopter. These aircrew centered design features included changes in the cockpit, aircraft weight, and drag coefficient. The cockpit evaluation compared the current MH-53E cockpit configuration with design changes currently under review by the Navy. This evaluation suggests that the proposed cockpit design display change may reduce aircrew load stress and improve mission effectiveness. Changes in subsystem components may either increase or decrease the weight of the MH-53E. Similarly, changes in crew tasking may result in a need for more or less fuselage volume size. Therefore, the sensitivity of MH-53E performance to generic changes in weight and drag was investigated in order to make source assessment of equipment and crew tasking changes upon MH-53E mission effectiveness.

DTIC

*Helicopter Design; Cockpits; Aerodynamic Coefficients; Design Analysis; Flight Crews; Helicopters; Systems Engineering; Human Factors Engineering*

19970028538 Armstrong Lab., Occupational Medicine Div., Brooks AFB, TX USA

Preventing Work-Related Musculoskeletal Illnesses Through Ergonomics: The Air Force PREMIER Program, Volume 1, anagement Guidelines *Final Report, Feb. 1994 - Jan. 1997*

Klinenberg, Edward J., Armstrong Lab., USA; Cogburn, Cynthia D., Armstrong Lab., USA; Goddard, Don E., Armstrong Lab., USA; Jan. 1997; 39p; In English

Report No.(s): AD-A327306; AL/OE-TR-1996-0158; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report introduces the AF PREMIER Program. The primary goal of the PREMIER program is to minimize the negative impact on AF mission accomplishment by preventing work-related musculoskeletal disorders (WMD) among AF employees. The AF PREMIER program consists of a series of modules designed to anticipate, recognize, evaluate, and control ergonomic risk factors associated with WMD development. This report describes the overall philosophy of the AF PREMIER program and provides detailed management guidelines for implementation of the program.

DTIC

*Musculoskeletal System; Human Factors Engineering; Disorders*



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